Trans-Lake Washington Project EIS Methodology Report – 6/10/02

Water Resources

Guiding Plans and Policies

The guiding plans and policies that will influence the water resources analysis for the EIS are summarized below. For clarity, surface water and groundwater are listed separately.

Surface Water

- Washington State Department of Ecology (Ecology), Clean Water Act (WAC 173-201A), and the Stormwater Management Manual for Western Washington, 2001
- Washington State Department of Transportation (WSDOT), Stormwater Management Plan and 2001 Draft Highway Runoff Manual, 1995
- WSDOT Environmental Procedures Manual, Sections 431, 432, and 433, July 2001
- King County Department of Natural Resources (DNR), Surface Water Design Manual, 1998
- Pollutant Instructional Letter 4020.02
- Chapter 173-207 Washington Administrative Code, *Puget Sound Highway Runoff Program*, governing retrofit of existing roads for water quality treatment
- Adopted state or local basin plans for surface water resources in the SR 520 corridor
- City and county critical or sensitive areas ordinances that establish buffers for streams and lakes

Groundwater

- Washington State Water Quality Standards (WAC 173-200)
- Washington Groundwater Management Areas (WAC 173-100)
- Washington Well Head Protection (WAC 246-290)
- Washington water rights regulations (various)
- Local Critical Aquifer Recharge Area (CARA) ordinances
- U.S. Environmental Protection Agency (EPA) well head protection regulations (Section 1428 of the Safe Drinking Water Act and corresponding State of Washington regulations)

- EPA water pollution control regulations (Section 431.02 of the Clean Water Act and corresponding State of Washington regulations)

Data Needs and Sources

State and local agencies, the design team, and other members of the environmental team will be contacted to obtain materials that will provide information about existing conditions within the study area and the proposed alternatives. The information that will be collected for this project and the data sources are summarized below.

Surface Water

- GIS base maps of the existing natural environment depicting the locations of streams, lakes, wetlands, buffers, Federal Emergency Management Agency (FEMA) 100-year floodplains and floodways, culverts, and sub-basin and watershed boundaries. Maps will be created using existing GIS data. The GIS data will be verified and supplemented as needed with FEMA maps, City and County Sensitive Areas maps, field investigations, and basin plans.
- Locations and conditions of outfalls that discharge runoff from the existing highway in the study area. It is assumed that WSDOT will provide the data and analysis in spreadsheet and GIS formats.
- Ambient water quality of the natural environment will be based on the Ecology 303(d) List and 305(b) Assessment.
- WAC 173-201A for stream classification and beneficial uses.
- Washington State DNR official water type reference maps for King County.
- Water quality data of runoff from the existing highway within the study area. It is assumed that WSDOT will provide the data and analysis in a spreadsheet format. If these data are not available, water quality data typical of highway runoff will be used for this analysis.
- Locations of all existing WSDOT water quality detention and treatment facilities within the existing SR 520 right-of-way, including the design standards, contributing basin, and outfall location. It is assumed that WSDOT will provide the data summarized in a spreadsheet format and on maps.
- Cut, fill, and edge of pavement lines for each alternative. The design team will provide the data in GIS format so that it will overlay with the water resources base maps. The GIS team will perform calculations to determine the area of new impervious surface in each sub-basin for each alternative.
- U.S. Department of Agriculture (USDA) soil survey maps. These maps will be used to determine soil types in the SR 520 corridor for conceptual designs of construction and detention best management practices (BMPs).
- U.S. Geological Survey (USGS) topographic 7.5 minute quadrangle maps. This information (if not provided in GIS) will be used to delineate sub-basin boundaries.

Groundwater

- Regional geology and hydrogeology from published Ecology and USGS sources.
- GIS base maps showing the following features in the SR 520 corridor:
  - Surficial geology
  - Topography
  - Regional groundwater elevation contours
  - Water bodies and streams
  - Locations of Class A and Class B wells and wellhead protection areas
  - Critical Aquifer Recharge Areas
  - Cut, fill, and edge of pavement lines for each alternative
  - Elevation profiles of each alternative
  - The design team, GIS team, and/or WSDOT will provide the coverages

Existing transportation-related impervious surface area within the SR 520 corridor and the impervious surface area by project segment for each alternative will be calculated by the GIS team.

Proposed Coordination with Agencies

State, federal, and local agencies will be contacted to discuss potential direct impacts on surface water and groundwater resources, including floodplains, hydrology, and water quality. This coordination will include at least two field trips with agency staff. Agencies may include King County, U.S. Fish and Wildlife Service, Washington State Department of Fish and Wildlife, National Marine Fisheries Service (NMFS), U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington State Department of Ecology (Ecology), and affected cities. These coordination meetings will be conducted in conjunction with field trips held by the ecosystems analysts.

Proposed Coordination with Team, WSDOT, and Sound Transit

In addition to coordination with state, federal, and local agencies, there will be coordination within the Team, WSDOT, and Sound Transit. The sections below summarize the coordination that will be conducted for surface and groundwater.

Surface Water

The following input will be required from the environmental and design teams:

- Groundwater – need locations of construction dewatering and discharge points to evaluate temporary construction impacts
- Hazardous Materials – need locations of contaminated soils that could be disturbed during construction activities to evaluate potential temporary water quality impacts
- Wetlands – need to identify wetland fill locations to evaluate potential cumulative impacts on water resources
- Design Team – need cut-and-fill lines and edge of pavement lines in a GIS format to evaluate potential operational impacts of each alternative

- Design Team – need construction methods, timing, and duration to evaluate potential construction-related impacts of each alternative
- Design Team – need proposed locations of stormwater facilities
- GIS Team – need base maps of water resources located in the SR 520 corridor to evaluate potential impacts

Additional coordination will be required with WSDOT and Sound Transit to determine the applicable standards for stormwater detention and treatment BMPs.

Groundwater

The following input will be required from the environmental and design teams:

- Surface Water – need locations of surface water runoff infiltration areas and quantity and quality of treated runoff to evaluate potential impacts on groundwater in general, as well as groundwater that is locally interconnected to surface water
- Hazardous Materials– need potential impacts on groundwater quality
- Land Use – need changes in impervious surfaces for each alternative to evaluate recharge reduction
- Design Team – need cut-and-fill lines and edge of pavement lines to evaluate potential recharge impacts of each alternative
- Design Team – need elevation profiles of each alternative to evaluate the potential for construction and operational dewatering
- GIS Team – need base maps of topography, geology, groundwater elevations, locations of Class A and Class B wells and wellhead protection areas, CARAs, etc. in the SR 520 corridor.

Study Area

The study area will include the SR 520 corridor and the sub-watersheds that contain the corridor and identified receiving waters.

Affected Environment Methodology

Existing conditions will be identified along the SR 520 corridor that could be affected by one or more of the proposed alternatives. The EIS will discuss both surface and groundwater resources within the study area.

Surface Water

The EIS will focus on the natural water resources potentially affected by the proposed alternatives. The study area is located entirely within WRIA 08 and includes the following surface water features: Lake Union, Portage Bay, Lake Washington, Fairweather Bay Creek, Yarrow Bay Creek, Kelsey Creek, Sammamish River, Bear Creek, associated tributaries, wetlands, and streams identified during field investigations.

The existing channel conditions, such as channel width, bank condition (riprap, pipes, incised, erosion), riparian vegetation, and substrate condition in the SR 520 corridor will be described qualitatively. Maps that depict the locations of streams, floodplains, and associated wetlands will support this narrative. The DNR type of each stream will be determined so that buffer widths can be established in accordance with applicable Sensitive Areas Ordinances. If a jurisdiction requires a stream type other than the DNR type, this type will also be determined.

The 100-year FEMA floodplain and floodway will be depicted on GIS maps. Any existing flooding problems identified by local agencies in the SR 520 corridor will be described. Locations of existing fill and/or structures in the floodplain will be summarized.

Ambient water quality of streams and lakes in the SR 520 corridor will be described using Ecology's 303(d) List and 305(b) Assessment. In addition, basin plans will be reviewed to identify water resources that are sensitive to particular pollutants, have been degraded by changes in flow regime, or have impaired water quality. Information on total maximum daily loads developed for water resources within the study area will be noted. The water quality class of streams and lakes in the study area will be determined using Ecology's classification system (WAC 173-201A), and the beneficial uses will be summarized.

In addition, the location of existing stormwater outfalls and treatment and detention BMPs identified by WSDOT (as stated above) will be mapped.

Groundwater

The baseline hydrogeologic and groundwater resources within the SR 520 corridor will be identified based on existing information. This will include general geology, hydrogeology (aquifers, groundwater flow directions, recharge/discharge areas), and general groundwater quality. Data sources will include published reports prepared by Ecology, Department of Health, and USGS. No field surveys, subsurface explorations, or groundwater quantity or quality testing will be performed for the EIS.

Environmental Consequences Analysis Methodology

Potential impacts associated with the Trans-Lake Washington Project will be identified along the SR 520 corridor and in the receiving waters for each alternative.

Impacts and mitigation for the EIS will be evaluated using the assumptions below for surface water detention and treatment.

Detention

- Receiving waters within the study area include Lake Union (Portage Bay), Lake Washington, and the Sammamish River. These are water bodies not requiring detention. It is important to note that the Sammamish River is not identified as a "receiving water" in the 2001 Ecology Manual. It is assumed WSDOT and/or local jurisdictions will successfully petition Ecology to include the Sammamish River as a receiving water in their revised stormwater manuals.

In areas subject to detention:

- Detention facilities will be assumed to meet the flow control requirements of the Ecology 2001 Manual.
- Predeveloped land cover will be assumed to equal mature forest in the areas corresponding to the existing and proposed roadway surfaces.
- Stormwater detention facilities will detain runoff from all impervious surfaces within the SR 520 footprint.
- Soil Conservation Service maps will be used to determine soil types.
- Total impervious surface area will be assumed to equal effective impervious surface area; basins where this assumption may differ will be noted but will not be evaluated.

Treatment

- It is assumed that stormwater treatment BMPs will meet Ecology's Basic Treatment Menu for discharges to Lake Washington, Lake Union, and Portage Bay. For other areas, a form of Ecology's Enhanced Treatment Menu, which targets removal of metals, will be assumed. Phosphorus treatment is assumed in the subbasin discharging to Lake Sammamish.
- Oil control BMPs will be required for "high use intersections" within the study area.

Methods that will be used to assess potential impacts on water resources for the EIS during construction and operation of the proposed alternatives are described below.

Direct Impacts – Surface Water

Direct impacts on surface water resources may occur at locations where a proposed alternative requires placing fill in the FEMA 100-year floodplain or floodway, extending culverts or constructing new culverts or pipes, and removing riparian vegetation within the buffer. Potential floodplain impacts will be evaluated qualitatively based on the volume of fill placed in the FEMA 100-year floodplain or floodway. Hydraulic modeling will not be conducted to quantify potential impacts or changes in flood elevations. Direct impacts on stream functions due to culvert extensions, new culverts, or loss of riparian vegetation will be qualitatively evaluated.

In addition, runoff from highways can directly affect both the water quality and hydrology of a stream and the water quality of a lake. Changes in hydrology may impact streams due to increased erosion and scour, increased flooding frequency, and decreased base flows. These impacts result in degradation of channel morphology and substrate, which provide fish and wildlife habitat.

Potential impacts related to changes in hydrology will be quantitatively evaluated for the EIS using the continuous hydrologic King County Runoff Time Series (KCRTS) model with level 2 flow control is a locally available HSPF-based software. The model will analyze:

- Current conditions (existing footprint)
- Post-project (unmitigated)
- Post-project (with detention)

The assumptions that will be used for this analysis are listed above. Potential changes in peak flow rates for each alternative will be compared. Streams that may be impacted by changes in hydrology will be identified.

A comparative analysis of potential water quality impacts on streams and lakes for each alternative will be conducted for the EIS as follows:

- Pollutant-generating impervious surface (PGIS) exposed to rainfall will be estimated.
- Pollutant-generating pervious surface (PGPS) exposed to rainfall will qualitatively discussed.
- Loading per storm event for existing conditions will be estimated using FHWA methodology (Driscol 1990), after which loading per storm for each proposed alternative will be estimated using the same method and assumptions.
- BMPs will be accounted for using removal efficiency rates reported in literature. Estimated loads/concentrations will not be compared to state water quality standards for stream concentrations or potential harm to fish.
- Additional water quality impact analysis may be required for permitting, but will not be included in the EIS.
- It will be assumed that the No Action Alternative will be evaluated with the treatment BMPs that will be constructed by 2002.

Direct Impacts – Groundwater

Potential impacts on groundwater quantity and quality will be evaluated for each alternative. The evaluations will focus on determining the potential of each alternative to adversely decrease the yields of existing wells or base flow discharge to local surface waters, and to degrade the quality of groundwater pumped for water supply or local surface water base flow.

Potential impacts may include recharge area reduction, roadway surface water runoff recharge, and spills of dangerous and hazardous chemicals.

The qualitative and quantitative measures that will be used to evaluate potential impacts are:

- Crossing lengths of critical aquifer recharge areas and wellhead protection areas measured in feet or miles
- Number of people served by potentially affected groundwater
- Crossing lengths of undeveloped shallow aquifers unprotected by overlying till or other similar low-permeability layer measured in feet or miles
- Project's completed impervious area
- Project's disturbed area footprint during construction
- Need for construction dewatering

The quality of treated runoff recharge and the potential impacts on groundwater will be coordinated with the surface water impacts.

Construction Impacts

Temporary impacts on surface water and groundwater during construction will be evaluated using the methods summarized in the sections below.

Surface Water

The following methods will be used for the EIS analysis to qualitatively evaluate the potential for temporary construction impacts:

- Identify locations where in-water and/or over-water work will occur
- Identify locations where stream by-pass or temporary diversion will be required
- Identify locations where dredging will be required
- Identify areas of riparian vegetation clearing
- Identify all locations where dewatering will occur and identify outfall locations
- Use data provided by others to identify possible pollutants of concern, other than turbidity

The feasibility of BMPs to reduce or prevent erosion, sedimentation, and pollution of stormwater will be assessed. BMPs will include source control, treatment, and scheduling. The EIS team will work with the design team to ensure that appropriate BMPs are proposed.

Groundwater

Potential short-term/construction impacts on the quantity and quality of the groundwater resource potentially affected by each of the alternatives will be described in general terms. Potential impacts may include design/predesign field studies such as pumping tests, dewatering for construction or slope stability, recharge of construction disturbed runoff, and other similar impacts.

Mitigation Measure Methodology

Methods to evaluate mitigation for potential surface water and groundwater impacts during construction and operation of the proposed project alternatives are summarized below.

Surface Water

As part of the EIS, detention and treatment BMPs will be conceptually designed. The assumptions that will be used for this analysis are listed in the *Environmental Consequences Analysis Methodology* section. Detention volumes will be estimated using a unit modeling approach. Because the WWHM (Ecology) facility sizing and estimate methods are still in development, King County spreadsheet estimation tools based on KCRTS (King County) will be used (i.e., unit volume factor × acres of impervious surface = approximate volume required). The KCRTS Level 2 detention standards will be considered equivalent to Ecology's flow context requirements. It will be assumed that all BMPs will be either ponds or vaults, with the same depths and side slopes, so that surface areas can be compared between alternatives.

Water quality BMPs will be conceptually designed using a unit modeling approach (i.e., precipitation factor × acres of basin impervious = approximate volume of BMP required). In addition to using traditional BMPs, a literature review will be conducted to evaluate the feasibility and practicality of alternative water quality treatment BMPs that may be more appropriate for portions of the project, such as the floating bridge, which have design and/or space constraints. Alternative BMPs may also be developed specifically to treat pollutant loads typical of site (highway) runoff. Alternative BMPs will be selected based on removal efficiencies in published literature; field investigations or experimental work will not be conducted. The EIS will also include a qualitative analysis of potential mitigation for stream function impacts associated with culvert extensions and floodplain fill. No additional analysis that may be required to demonstrate compliance with state water quality standards will be performed as part of the EIS.

Coordination with WSDOT and appropriate agencies, such as Ecology, King County, and the affected cities, will be required to determine the standards to which detention and treatment BMPs should be designed. In addition, consultation with NMFS and/or USFWS will be required to determine if they will accept traditional treatment BMPs to protect listed fish species. Additional analysis may be required by NMFS and/or USFWS to demonstrate "no harm" to fish; this additional analysis will be included in the project's Biological Assessment.

Mitigation such as treatment of offsite nonproject runoff will not be addressed in the EIS.

Groundwater

General mitigation techniques that would allow construction through sensitive groundwater areas will be qualitatively described. The techniques will typically focus on minimizing the loss of aquifer recharge volume and minimizing the transport of contaminants in treated runoff recharge. Potential groundwater mitigation will be coordinated with surface water mitigation.

Surface Water

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